BY ORDER OF THE COMMANDER
911TH AIRLIFT WING

911TH AIRLIFT WING INSTRUCTION 40-102

18 March 1999

Medical Command

RADIATION SAFETY

COMPLIANCE WITH THIS PUBLICATION IS MANDATORY

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This instruction implements AFPD 40-2, *Radioactive Materials (Non-Nuclear Weapons).* It establishes responsibilities and specifies procedures for implementing regulations established by the US Nuclear Regulatory commission (USNRC) concerning the use of radioactive materials licensed by the USNRC and the US Air Force Radioisotope Committee (RIC). It also covers the overall radiation safety program including radiation sources not controlled by the USNRC, radiation safety instructions for workers, reporting of defects or items of noncompliance that relate to significant safety hazards, the availability of certain reports and documents, and laser safety.

SUMMARY OF REVISIONS

This is a revision of 911 AWI 40-102, 5 November 1996. It makes some minor administrative changes to the previous publication and updates the format. A (|) indicates revisions from the previous edition.

1. References:

1.1. Section 206, Energy Reorganization Act of 1974, Public Law 93-4398, title II, October 11, 1974, 88 Stat 1246 (codified in 42 USC 5846).

1.2. USNR Rules and Regulations, Title 10, Chapter I, Code of Federal Regulations:

1.2.1. Part 19 (10 CFR 19), Notices, Instructions and Reports to Workers; Inspections and Investigations.

1.2.2. Part 20 (10 CFR 20), Standards for Protection Against Radiation.

1.2.3. Part 21 (10 CFR 21), Reporting of Defects and Noncompliance.

1.2.4. Part 31 (10 CFR 30), General Domestic Licenses for Byproduct Material.

1.3. AFI 40-201, *Managing Radioactive Material in the USAF.*

1.4. AFI 48-125, *The US Air Force Personnel Dosimetry Program*

1.5. AFPD 40-2, *Radioactive Materials (Non-Nuclear Weapons).*

1.6. USAF radioactive Material Permit No. 37-30236-1 AFP, Docket No. 030-90157.

1.7. AFOSH Std 161-10, *Health Hazard Control for Laser Radiation*.

2. Introduction:

2.1. The purpose of these procedures is to keep exposures to ionizing radiation as low as reasonably achievable (ALARA) and control exposures to laser radiation. The 911th AW Commander is committed to the program described herein for keeping individual and collective doses ALARA. In accordance with this commitment a qualified individual is designated in writing as the Base Radiation Safety Officer (RSO).

2.2. We will perform a formal annual review of the radiation safety program, including ALARA considerations. This will include reviews of operating procedures and past does records, inspections, etc., and consultations with the radiation safety staff or outside consultants.

2.3. Modifications to operating and maintenance procedures and to equipment and facilities will be made if they will reduce exposures unless the cost, in our judgement, is considered to be unjustified. We will be able to demonstrate, if necessary, that improvements have been sought, that modifications have been considered, and that they have been implemented when reasonable. If modifications have been recommended but not implemented, we will be prepared to describe the reasons for not implementing them.

2.4. In addition to maintaining doses to individuals as far below the limits as is reasonably achievable, the sum of the doses received by all exposed individuals will also be maintained at the lowest practicable level. It would not be desirable, for example, to hold the highest doses to individuals to some fraction of the applicable limit if this involved exposing additional people and significantly increasing the sum of radiation does received by all involved individuals.

3. Responsibilities:

3.1. The Commander, 911th AW:

3.1.1. The Commander, 911th AW, has executive authority over the radiation safety program including activities conducted under USAF permits issued to base organizations.

3.1.2. The commander shall appoint, in writing, a Base Radiation Safety Officer (RSO) and any alternate Radiation Safety Officers necessary to manage the Radiation Safety Program. The title of Radiation Safety Officer is administrative only and does not necessarily connote commissioned status.

3.1.3. The commander shall be informed of any item of noncompliance with USNRC or USAF regulations or any defect in facilities or equipment that may result in a substantial safety hazard means a loss of safety function such that there is a major reduction in the degree of protection provided to public health and safety, re. 10 CFR 21.3(k) and AFOSH Std 161-10.

3.2. The Radiation Safety Officer (RSO). The RSO is charged with ensuring all devices which produce ionizing radiation, all radioactive materials, and all lasers are used safely and in compliance with USNRC criteria, USAF regulations, USAF Radioactive Materials Permit conditions, and AFOSH Std

161-10. The RSO may delegate routine administrative tasks to the permit Radiation Safety Officer (PRSO) for oversight of permitted radioactive material use.

3.2.1. The RSO is charged with the conduct of the base radiation safety program. The RSO is the individual designated by the Commander to investigate, evaluate, initiate corrective action, and report on defects or noncompliance items relating to substantial safety hazards involving radioactive materials, radiation producing devices, or lasers. The RSO has the authority to enforce Federal Air Force, and base rules and regulations relating to radiation safety. The RSO has the authority and responsibility to terminate any operation that poses a substantial radiation safety hazard except in those instances where such action could place the safety and well being of patients or others in greater danger than that posed by the radiation hazard.

3.2.2. The RSO will report to the Permit Radiation Safety Officer any occurrences or activities involving radioactive materials or pertaining to that organization's Radioactive Materials Permit that come to their attention.

3.3. The Permit Radiation Safety Officer (PRSO). The PRSO is that individual appointed by the USAF Radioisotope Committee, and named on the Radioactive Materials Permit under the requirements of 10 CFR 35.900 who is responsible for the radiation safety duties. Assistant and alternate permit Radiation Safety officers may be approved and appointed as necessary to properly carry out these duties. Alternate permit Radiation Safety Officers must meet all the appointment requirements of the permit Radiation Safety officer.

3.4. Authorized Users. "Authorized User" means those individuals who, by virtue of their formal training and/or experience, are identified as an authorized user of radioactive material (named on the Radioactive Materials Permit), radiation producing devices, or lasers.

3.4.1. New Uses. The authorized user will consult with the RSO, and the PRSO if applicable, during the planning stage for new uses to ensure that the use complies with regulatory requirements and the proper safety measures are utilized. New uses of radioactive materials, radiation producing devices, or lasers will not commence until they are reviewed and approved by the RSO.

3.4.2. Supervision of Workers. The authorized user, with the assistance of the RSO, will explain required safety measures, the ALARA concept, and the need to maintain exposures ALARA to all supervised individuals and will ensure that these personnel are trained in good health physics practices and in methods to minimize exposures.

3.5. Workers:

3.5.1. Each individual involved with the use of radioactive materials, radiation producing devices, or lasers has a responsibility to comply with applicable USNRC and USAF regulations and permit conditions for the protection of their own health and safety and that of others. Each individual is also responsible for reporting promptly any violation of USNRC regulations, USAF regulations, permit conditions, or any defect in facilities or equipment that may affect health and safety. All workers who receive occupational exposure to radiation will follow ALARA principles and maintain exposures ALARA to the greatest extent possible.

3.5.2. Women who work with ionizing radiation are responsible for informing supervisors of any possible pregnancy. This discussed later in this regulation.

4. Posting Requirements:

4.1. Copies of this regulation and the other cited Air Force regulations are maintained and available for review in Bioenvironmental Engineering Office, Bldg. 328. Referenced sections of Title 10, Chapter I, Code of Federal Regulations and the Radioactive Materials Permit(s) are maintained and available for review. A copy of this regulation shall be available within the immediate area where activities involving the use of radioactive materials, radiation-producing devices, or lasers are conducted.

4.2. The following items will also be posted in areas covered by a Radioactive Materials Permit in a location where workers are frequently present: an NRC Form 3, Notice to Employees and a supplemental notice of permit and air Force Master Materials License documentation availability in accordance with 10 CFR 19.11. The supplemental notice regarding availability of the Air Force Master Materials License and permits for review is given in AFI 40-201.

5. Areas of Use:

5.1. Radioactive materials are routinely stored and used in the 911th SPTG/CEX, Disaster Preparedness. Storage areas include 911th SPTG/CEX, Disaster Preparedness.

5.2. Radiation-producing equipment is routinely used in Medical Radiology, the Dental Clinic, and Nondestructive Inspection's (NDI) shielded exposure room. NDI x-ray machines may also be used in unshielded locations with the approval of the RSO.

6. Exposure Limits:

6.1. Personnel who work with radioactive material or radiation producing devices may be exposed to radiation during the course of their employment. It is the goal of the radiation safety program to maintain all radiation exposures ALARA. It is important to understand the procedures used to monitor for radiation exposure and the significance of a radiation does obtained during routine work activities.

6.2. Federal regulations (10 CFR 20.1201 and 1207) specify the maximum permissible dose limits for radiation workers. The limits, in units of millirem (mrem) are listed below.

Annual Limit To:	Radiation Workers (mrem)	Working Minors (mrem)
Total Body or	5,000	500
Summation*	50,000	5,000
and		
Lens of Eye	15,000	1,500
Extremities	50,000	5,000

The sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye.

6.3. In addition, 10 CFR, Part 20.1301, specifies that radiation levels are not permitted in unrestricted areas (i.e. areas accessible to the general public) which could cause an individual to receive doses in excess of the limits listed below:

Any Year	100 mrem
Any One Hour	2 mrem

If integrated radiation levels could exceed these limits, the area must be restricted.

7. Personnel Dosimetry Procedures:

7.1. Dosimeters are issued on an individual basis and may be obtained by contacting Bioenvironmental engineering. The following guidelines are used:

7.1.1. All individuals who are occupationally exposed to ionizing radiation on a regular basis and who, based on documented past exposures, may be exposed to radiation that may result in doses greater than 10% of the annual limit, will be enrolled in the USAF Personnel Dosimetry Program and issued a radiation dosimeter.

7.1.2. Individuals occasionally exposed, but whose total dose is not expected to exceed 10% of the limit, may be issued a whole body monitor when performing those duties, if in the judgment of the RSO such issue is desirable for any reason.

7.2. Each supervisor who has personnel in the dosimetry program is responsible for assuring that the control dosimeter and any badges not in use are stored in a convenient low radiation area.

7.2.1. The area supervisor is responsible for ensuring that all personnel working regularly in radiation areas who are entered into the dosimetry program wear their dosimeters correctly.

7.2.2. Dosimetry results will be provided annually.

7.2.3. When not in use, dosimeters must be stored in the designated area and not left attached to garments or stored in desk drawers. They are not to be taken home.

7.3. Each month or quarter, a report of the exposures recorded on the dosimeters in published (AL Listing 1499-1 and 1499-2). This report is reviewed by the RSO to determine if the exposures recorded are in compliance with the ALARA program. The results are then forwarded to area supervisors.

7.4. Classification of radiation doses is accomplished according to the system described below. For doses less than Investigation level I, no action will be taken except when deemed appropriate by the RSO.

7.4.1. Investigation Level I. The RSO will review the exposure and consider each such exposure in comparison with those of others performing similar tasks as an index of ALARA program quality and will record the review.

	Dose (mrem/calendar quarter)
	Greater than or equal to
Total effective dose equivalent	125
Eye dose equivalent	375
Skin or extremity shallow dose equivalent	1250

7.4.2. Investigation Level II. The RSO will investigate the cause of the exposure and, if warranted, will take corrective action. A written report of the investigation, actions taken, will be presented to the 911 AW/CC and /or Aerospace medicine Council.

	Dose (mrem/calendar quarter) Greater than or equal to
Total effective dose equivalent	375
Eye dose equivalent	1125
Skin or extremity shallow dose equivalent	3750

8. Procedures for Personnel Training:

8.1. All personnel who are classified as occupational radiation workers will receive regular training on radiation safety. This training is to be specific for the work area. Immediate supervisors are responsible for ensuring that all personnel receive this training.

8.2. The RSO will provide initial training for all personnel when they enter the dosimetry program and for any new employee working in or frequenting radiation areas. The RSO will document topics and attendance at all training sessions. The RSO is also responsible for providing training on an as-needed basis for any personnel whom enters a restricted area.

8.3. The RSO is responsible for providing annual training for emergency workers who may have cause to enter a restricted area (i.e., police, security, and firefighters).

9. Procedures for Reporting Unsafe Conditions:

9.1. Any worker or representative of workers who believes that a violation of USNRC or USAF regulations or permit conditions has occurred, or that any defect in facilities or equipment exists which could cause unnecessary radiation exposure should report such conditions to:

9.2. Reports by workers may initially be submitted verbally, but should be resubmitted in writing within five workdays for proper documentation.

9.3. Requests for inspection of violations or defects involving radioactive material possessed under authority of the USAF Radioactive Material Permit, may also be made directly, in writing, to the USAF Radioisotope Committee, the USAF Inspector General, or the USNRC Office of Inspection and Enforcement, in accordance with 10 CFR 19.16(a).

9.4. The RSO or a designated representative shall immediately inform the base commander of the alleged violation, safety defect, or hazard.

9.5. The RSO or designated representative shall conduct an investigation to determine whether or not a substantial safety defect, hazard or noncompliance exists. The findings shall be reported in writing to the base commander and a copy shall be filed with the appropriate case file and USAF Permit if radioactive material is involved.

9.6. For radioactive material; if a substantial safety defect, hazard or noncompliance does exist, corrective action shall be taken and notification shall be provided to the USAF Radioisotope Committee

by the PRSO or a designated representative within two days of the determination. If initial notification is by telephone, a written report shall be submitted to the USAFR Radioisotope Committee within 5 days following the determination.

9.7. All written reports and correspondence with the USAF Radioisotope Committee shall be submitted by the PRSO or a designated representative through RSO, Bioenvironmental Engineering, the medical facility commander, wing commander, and command headquarters, in turn.

10. Procedures for Fertile Females Receiving Occupational Exposure to Ionizing Radiation:

10.1. Many military and civilian women are assigned by the Air Force to jobs requiring possible occupational exposure to ionizing radiation. The potential exposure in some of these jobs is so low that it is virtually impossible for individuals performing them to receive annual whole body exposures above the limits to which non radiation workers may be exposed under present federal radiation protection guidance. Other jobs, however, may result in an individual routinely receiving measurable radiation doses above this limit. In these instances, concern must be given to protecting the unborn child which is particularly sensitive to the effects of ionizing radiation.

10.2. National exposure guidelines have been established by the National Council on Radiation Protection and Measurements (NCRP) to minimize the risk to the unborn child. These guidelines recommend that the total dose to the child during pregnancy be kept as low as reasonably achievable but should never exceed 500 mrem. The USNRC has made these guidelines part of their regulatory requirements in 10 CFR 20.1208. In keeping with the NCRP recommendations and USNRC regulations, the Air Force policy for Occupational Exposure of Fertile Females to Ionizing Radiation is specified in AFMSC/SGPA policy letters dated 4 August 1983 and 21 November 1983. This policy is summarized below:

10.2.1. Each female who may be occupationally exposed to ionizing radiation shall be informed by the RSO of the USAF policy as well as the recommendations of the NCRP to limit radiation exposure during pregnancy and the importance of immediately notifying her supervisor if she suspects she is pregnant. The individual will be given the opportunity to ask questions and will be required to acknowledge in writing that she has been advised of this policy. Documentation will be maintained.

10.2.2. A female who is occupationally exposed to radiation is responsible for controlling exposures to the fetus/embryo. She must declare, in writing, to both her immediate supervisor and the base RSO, her pregnancy and must include an estimated date of conception. The RSO will then evaluate the individuals specific duties involving exposure to radiation. This evaluation will include consideration of the workplace and the source of radiation, the individual's history of exposure to radiation as documented by personnel dosimetry records, current radiation measurements applicable to her specific tasks, current exposure histories of coworkers, and likely exposures that would be incurred in the event of a credible accident.

10.2.3. If the RSO determines it is unlikely that the female would receive a total exposure during the term of the pregnancy (including the period preceding the confirmation of the pregnancy) in excess of 500 mrem, she may continue in her radiation related duties. If the individual is not already on the Air Force personnel dosimetry program, she will be enrolled for the duration of her pregnancy. Arrangements will be made with USAFR AL/OEBD to receive, in addition to the laboratory's routine written report, message notification of the individual's dosimetry results as soon

as each dosimeter is processed by the laboratory. Should exposure results indicate a trend which, if continued, could result in exceeding the 500 mrem annual limit, or should she receive more than 50 mrem in any month after her pregnancy is declared, a reevaluation will be made as to whether she should continue her radiation duties, be restricted from certain high risk duties, or be removed entirely from occupational exposure.

10.2.4. Special consideration must be made when a pregnant worker's radiation duties involve the operation of high output sources or the use of unsealed radioactive materials. Pregnant workers shall not continue in duties involving these sources without specific approval of HQ AFMOA/ SGPR. When a pregnancy is reported to the immediate supervisor, women working with such sources or materials will receive a prompt evaluation, and, if warranted, action may be taken prior to confirmation of the pregnancy.

10.2.5. A pregnant female is afforded special monitoring, protection limits, and duty restrictions only when she declares herself to be pregnant in writing. If the pregnant female does not wish this special status, she may declare this wish in writing and will, from this point on, be covered by the dose limits for the non-pregnant radiation worker with no special fetal monitoring or restrictions in duties.

10.2.6. A female also has the authority, at any time, to not declare a pregnancy. This must also be in writing to their immediate supervisor and the RSO.

11. Requests for Radioactive Materials, Radiation Producing Devices, and Facility Modifications:

11.1. All requests for new radioactive materials, new uses of radioactive materials, or changes in the area of use of radioactive materials must be approved by the RSO prior to the material being ordered or the change taking place. Approval may be requested by forwarding a letter to the RSO which states the intended use of the new material or a description of the change in use, the radionuclide involved, the form of the radionuclide, the activity, the name of the supplier, and the location of the proposed area of use.

11.2. All requests for new radiation producing devices or modifications to existing radiation producing devices or facilities must be approved by the RSO prior to the device being ordered the change taking place. Approval may be requested by forwarding a letter to the RSO that states the intended use of the new device or a description of the proposed modification, the location where the device will be used, and the name of the manufacturer.

11.3. All facility modifications taking place in area where radioactive materials or radiation producing devices are currently used must be reviewed and approved by the RSO prior to the modification taking place. All facility modification necessary to accommodate new uses of radioactive materials or radiation producing devices must be approved by the RSO prior to the work taking place. Approval may be requested by forwarding a letter to the RSO that thoroughly describes the intended modification. The requester and the RSO will ensure that this approval has been received prior to work commencing.

12. Receiving Radioactive Material and Radiation Producing Devices:

12.1. Each section that expects to receive radioactive materials on a recurring basis must prepare an operating instruction that addresses their procedures in detail. If requested, the RSO will provide

assistance in preparing these instructions. When completed, this operating instruction must be submitted to and approved by the permit RSO.

12.2. Sections that receive radioactive materials infrequently (i.e., once per year or longer) must coordinate receiving procedures with the RSO prior to the arrival of the material.

12.2.1. On notification that the item has arrived, the RSO will either inspect and monitor the package or merely request notification when the package is delivered to the user. Only the RSO or the user shall open the package. The action taken will depend on the hazard associated with the particular item and the condition of the package.

12.2.2. After the package is opened by the user and the contents examined, the RSO will be notified immediately if there is either a discrepancy between the item(s) ordered and received or if the item(s) appear damaged. If all items are as ordered and in acceptable condition, the RSO will be notified in writing of the receipt (copies of shipping documents should be included).

12.3. Special precautions must be taken by the permittee when receiving and opening packages that contain radioactive material.

12.3.1. Visually inspect the package and, if damaged, notify the RSO immediately.

12.3.2. Measure the exposure rate and, if greater than expected, contact the RSO.

12.3.3. Wear gloves if the package contains liquids and is to be opened.

12.3.4. Verify the contents with the packing slip.

12.3.5. Examine the integrity of the final source container.

12.3.6. If anything unusual is encountered contact the RSO.

12.3.7. As specified in 10 CFR 20.1906, packages containing in excess of certain specified quantities of radioactive material must be monitored for external radiation and contamination within 3 hours after receipt during working hours and within 18 hours if received after working hours.

12.4. The RSO must be kept informed of delivery and installation schedules for new radiation producing devices. Prior to the operation of these devices the RSO must accomplish a radiation survey of the device to ensure that all required radiation safety requirements have been met.

13. Procedures for Waste Disposal:

13.1. Each organization that may generate radioactive waste during the course of its operation(s) will assume full responsibility for collection, packaging, storage and disposal of radioactive waste generated. If accomplished properly, the potential for contamination of the environment or subjecting personnel to unnecessary radiation risks, will be eliminated. Since there will be no central radioactive waste storage location, each organization will provide a secure, isolated area for temporary storage of its own waste, on-site, near the location where it is generated. Each site will be approved by the RSO. When a container is filled and ready for disposal, the RSO will be notified in writing. The RSO will make arrangements for pickup of the waste by a disposal contractor authorized by SA-ALC/EMP. Contracts for pickup and disposal of radioactive waste will NOT be made by the generator.

13.2. Management of Radioactive Waste. To ensure safe handling of radioactive waste, specific procedures must be established by the RSO. Any proposed deviations from these procedures must be

submitted in writing to the RSO and approval must be obtained prior to implementation of the alternative procedures.

14. Emergency Procedures and Reporting Requirements:

14.1. Spills of radioactive material. A spill is not limited to liquids. Release of radioactive material from its container irrespective of the form of the material is considered a spill. The materials may be in powdered form, liquid, gas, or a solid mass. Spills pose a hazard because of the potential for: (1) contamination of the environment, (2) contamination of the skin of personnel, (3) ingestion or inhalation of radioactive material, and (4) production of a high radiation field that may result in a radiation does exceeding permissible limits even if the individual does not become externally contaminated. A spill may result from a simple incident such as the dropping of a container or it may result from a more serious event such as a fire or explosion.

14.2. Production of a radiation field by an X-ray machine, irradiator, accelerator or radioactive material (even if the material is completely contained). An X-ray machine, radioisotope irradiator, or accelerator may be emitting radiation when it is supposed to be off, such as; when a switch or circuit malfunctions and the unit does not shut down when switched off or it may be emitting radiation into an area where it is not expected, such as: when an accelerator beam is deflected into the wrong experimental area. In these instances, individuals may be exposed to high radiation fields possibly without their knowledge.

14.3. Response Procedures:

14.3.1. Differences in response to the two situations described above include:

14.3.1.1. For spills, the material must be confined to prevent further contamination and individuals/environment must be decontaminated.

14.3.1.2. For radiation fields, individuals must be removed from the radiation field or the radiation source must be interrupted (e.g., turning off the X-ray machine or shielding the source).

14.3.1.3. For both cases, the primary concern is first, the protection of individuals in the vicinity including emergency response personnel, and second, the protection of the environment. Lifesaving activities always take priority over other considerations. In fact relatively large personnel exposures may be permitted for life saving procedures. This, however, is a one time permissible exposure that can never be repeated. Essential first aid always takes precedence over decontamination.

14.3.2. Emergency procedures are divided into two categories:

14.3.2.1. The category involves generic response procedures, that is, procedures applicable to most situations.

14.3.2.2. The second category involves site-specific response procedures, that is procedures unique to a specific location of situation.

14.3.3. This regulation describes typical generic response procedures. Site-specific procedures are developed by the user. Copies of both generic and site-specific emergency response procedures are maintained by the RSO and are made available to emergency response teams such as the Fire Department, Security Force and Disaster Preparedness. The RSO will either direct or delegate responsibility for all radioactive material cleanup operations.

14.3.4. Generic Emergency Response Procedures:

14.3.4.1. Spills. An acronym used by some groups to assist in recalling spill control procedures is SWIMS that stands for:

Stop the spill

Warn others

Isolate the area

Minimize the exposure

Secure unfiltered exhaust

A somewhat more detailed explanation of the procedures is presented below:

14.3.4.1.1. Prepare for a spill by having a "spill kit" readily available complete with all of the items required to respond.

14.3.4.1.2. Advise all personnel not directly involved with the initial spill incident or the subsequent cleanup to evacuate the area. Anyone suspected of being contaminated during the incident or cleanup should not leave the area until monitored and decontaminated if necessary.

14.3.4.1.3. One individual should assume responsibility for immediate actions. This is not the time to argue protocol or seniority. Just as for CPR where the individual who starts CPR is in charge until the relinquishes control, so in a spill, the individual who starts giving commands should continue to do so until a more qualified and knowledgeable individual arrives on scene.

14.3.4.1.4. Stop the spill if possible. This may involve turning a container right side up, capping it or throwing some material over the source to absorb or stifle the emissions. In either case, the benefit of performing this activity (e.g., preventing contamination from spreading to uncontrolled areas) must be balanced by the risk to the individual performing it (e.g., contamination, inhalation or exposure of the individual). If all of the contents have escaped from the container, don't waste time capping it.

14.3.4.1.5. Warn individuals not involved in the spill to evacuate the area. Designate someone to call for assistance. Call the RSO and others, such as the supervisor, radiation monitor, or emergency response teams (e.g., fire department or ambulances) as required. The RSO will ensure that all notifications required by AFI 40-201 and 10 CFR 20.403 and 20.405, are accomplished.

14.3.4.1.6. Determine extent of the spill. If liquid or solid, try to mark boundaries. If gas, which areas are affected.

14.3.4.1.7. Secure unfiltered exhaust and any other pathways outside the area (e.g., air vents, windows, drains, etc.).

14.3.4.1.8. Don protective equipment such as gloves, boots, anti-contamination clothing (anti-C's), and respirators. Minimize the number of personnel involved. Protective gear such as self contained breathing apparatus (SCBA) and bunker suits used by fire fighters will normally provide sufficient protection from contamination although monitoring should be accomplished prior to removing such equipment to prevent inadvertent contam-

ination.

14.3.4.1.9. Measure radiation levels. Use meters, air samplers, etc.

14.3.4.1.10. Monitor all personnel. Obtain all information necessary to perform follow-up evaluations on personnel (e.g., name, address, phone numbers, SSAN, location at scene, duration of exposure, etc.). Check individuals for external contamination. If clothing is contaminated, remove it. If skin is contaminated, shower or wash, depending on available facilities. Although contamination should not be permitted to enter the sanitary system, personnel decontamination takes priority. Consider the need for internal evaluation (i.e., bioassay sampling such as urine, feces, nasal swabs, etc.). Bioassay samples are best collected immediately (provided external contamination of the sample is not a problem) and again after 24 hours. The RSO will provide guidance on follow-up sampling intervals.

14.3.4.1.11. Monitor environment and surfaces. Clean up if contaminated and collect all waste in plastic bags and place in sturdy containers.

14.3.4.1.12. For fires, water should be used sparingly since it may tend to spread contamination.

14.3.4.1.13. Radioactive material not involved in the incident should not be moved. Transporting sources to an alternate storage location during an incident to safeguard them is not recommended. Such actions tend to increase the possibility of personnel exposure or contamination due to accidental spills in transit. It is also possible that such actions could cause a loss of control over the sources. Under normal circumstances, the location of most sources will be known in advance and measures can be taken to deal with them. However, if an attempt is made to move sources, the attempt may not be successful and response personnel might not then be aware of their new location. This could pose a greater hazard than initially existed.

14.3.4.1.14. After the cleanup has been completed, a report of the incident will be prepared as directed by the RSO and a copy submitted to the wing commander.

14.3.5. Radiation Fields. Accidents involving potential exposure to radiation fields are easier to deal with than spills although no less hazardous. The following procedures are recommended:

14.3.5.1. Shut down the source. For an X-ray unit this may involve interrupting the electrical supply either at the unit or at a main panel. For a radioisotope irradiator containing radioactive material it may be necessary to shield the source. In some cases it may not be possible to stop the radiation.

14.3.5.2. One individual should assume responsibility for immediate actions.

14.3.5.3. Warn others of the problem and send for assistance from the RSO and others.

14.3.5.4. Isolate the area by closing doors or setting up improvised barriers to prevent entry. Be certain that no one is in the area before securing it.

14.3.5.5. After the situation has been corrected, a report of the incident will be prepared as directed by the RSO.

14.3.6. Emergency Response Teams:

14.3.6.1. The RSO will provide initial training and annual refresher training to all personnel who may be called on to respond to accidents/involving radioactive material or radiation-producing devices.

14.3.6.2. Supervisors will be responsible for informing the RSO of newly assigned personnel to permit scheduling of initial training.

14.3.6.3. A listing of locations where radioactive material or radiation-producing devices are stored or used, a summary of the sources located in each area and a copy of the site-specific emergency procedures provided by the organization possessing the sources will be made available to each emergency response team.

15. Laser Hazard control Program:

15.1. Information is designed to supplement the information contained in Air Force Occupational and safety Standard (AFOSH Std) 161-10, *Health Hazards Control for Laser Radiation.*

15.1.1. All people responsible for procurement, operation and/or maintenance of laser systems must be familiar with the requirements of AFOSH Std 161-10 and the requirements of this regulation.

15.2. Responsibilities:

15.2.1. Commanders, in addition to the requirements of AFOSH Std 161-10, will ensure that the RSO is notified of all people being assigned to or being removed from a position where exposure to laser radiation is possible.

15.2.2. The RSO will accomplish all actions required by AFOSH Std 161-10 as well as keeping a current inventory of all laser systems on base.

15.2.3. Unit safety officers will periodically check laser installations for labeling and posting requirements. Discrepancies are identified to the RSO

15.2.4. Laser users will be familiar with requirements of AFOSH Std 161-10 and this regulation.

15.2.5. Occupational Health Office will administer/schedule physical examinations required by AFOSH Std. 161-10.

15.2.6. Contract administrators will ensure contractors conform with Air Force and base safety and physical exam requirements.

15.3. Base Laser Program. All requests to order laser-producing devices must be routed through the RSO for approval. Before operating any laser on base, the laser must be added to the inventory, classified, and the proposed operation reviewed by the RSO. Use of any laser without these steps being completed will be immediately terminated by the RSO.

15.3.1. Inventory. The RSO must keep a current inventory of all lasers on base and those operated by base people at other locations. This inventory is the basis of the Laser Hazards Control Program. The user must tell the RSO when new systems are installed, current systems are modified, current systems are moved from one location to another, or laser usage is terminated.

15.3.2. Classification of Lasers. Each laser is assigned a classification according to AFOSH Std 161-10. The user must forward the operating parameters listed in **Attachment 1** to the RSO so

that a classification may be assigned. Special arrangements can be made for classified laser parameters. Call the RSO for information.

15.3.3. Labeling of Laser. All lasers must have an American National Standard Institute hazard classification label prominently displayed. Manufacturer's labels may be supplemented to provide the required information.

15.3.4. Warning Signs. Warning signs and beacons, if required by AFOSH Std 161-10, are positioned with the help of the RSO and safety people.

15.3.5. Hazard Evaluations. Hazard evaluations are performed on all laser system installations. This is accomplished by the RSO to determine specific hazards of the laser system. The information in **Attachment 1** is used to make the hazard evaluation.

15.3.5.1. The RSO will conduct a laser Hazard Evaluation to determine the Nominal Ocular Hazard Zone (NOHZ) associated with the laser and the ocular density (OD) of any laser protective eyewear required.

15.3.5.2. Movement of a laser for storage or use in a new location requires RSO notification and a new survey to be conducted.

15.3.5.3. The RSO will survey the area to ensure all safety precautions, labeling and posting requirements are met.

15.3.5.4. The RSO makes periodic, at least annual, surveys of laser work areas to ensure continued safe operation of the laser system.

15.3.5.5. The RSO may direct the appropriate commander to terminate any laser use that does not meet the requirements of this regulation or AFOSH Std 161-10.

15.3.5.6. In certain situations the indoor or outdoor use of lasers may require evaluation according to AFR 19-2, *Environmental Impact Analysis Process (EAIP).* The operators of all such lasers must ensure that they comply with this regulation.

15.4. Medical Examinations:

15.4.1. All people newly assigned to ANSI Class 3b or 4 laser duties must have an eye examination before assignment to these duties. These examinations are scheduled with an ophthalmologist or an optometrist. The user must send a letter to the RSO requesting the eye examination. Include the individual's name, SSAN, grade/rank, unit, and phone number. The RSO endorses the letter to Occupational Health Office for action.

15.4.2. Upon termination of Class 3b or 4 laser duties (PCS/PCA, retirement, separation, or assignment to duties that no longer involve lasers) the individual must have a termination examination. This examination should be as soon as practical following termination of laser duties and is requested by letter to the RSO with endorsement to Occupational Health Office. This requirement should be included in unit clearance actions.

15.5. Investigation of Laser Incidents. All incidents where it is suspected people may have been overexposed to laser radiation are reported to the RSO and the unit safety officer. Investigation of the incident is conducted according to AFOSH Std 161-10. Information needed for the investigation is in **Attachment 1**, paragraph 1. Do not delay reporting the incident.

15.6. Medical Report of Laser Incidents. Information in **Attachment 2**, paragraph 2, is required for a report of survey in support of an accident investigation according to AFOSH Std 161-10.

F. BAXTER LANE, Col, USAFR
Commander

Attachment 1

INFORMATION REQUIRED FOR CATEGORIZATION AND HAZARD EVALUATION

Requester:

Rank/Grade: _____ Name: _____ Date: _____

Organization: _____ Telephone: _____

Primary Operator:

Rank/Grade: _____ Name: _____ Date: _____

Organization: _____ Telephone: _____

(Attach supplementary sheet for additional operators)

Laser Description:

Manufacturer: _____ Address: _____

Model No: _____ Serial No.: _____

Lasing Medium: _____ Operating Time/Day: _____

Open Beam: ___Yes___No Laser Location: Building: _____Room: _____

Beam Parameters:	***Continuous***	***Single Pulse***	***Multiple Pulse***
Wavelength	_____	_____	_____ nanometers
Output Power	_____	XXXXXX	XXXXXX watts/mW
Output energy/Pulse	XXXXXX	_____	_____ joules/mJ
Pulse Width	XXXXXX	_____	_____ milliseconds

Beam Parameters:	***Continuous***	***Single Pulse***	***Multiple Pulse***
Pulse Repetition Frequency	XXXXXX	XXXXXX	_____ Hz
Beam Cross Section:	___ Circular	___ Rectangular	___ Elliptical
Beam Diameter	_____ by _____ centimeters/mm		
Beam Divergence	_____ by _____ milliradians/rad		
Diameter and Divergence Measured at	__ 1/e	__ 1/e2	

Attachment 2

INCIDENT/ACCIDENT INVESTIGATION AND MEDICAL REPORT

1. Information needed for incident/accident investigation:
   a. Type of laser and nomenclature.
   b. Organization responsible.
   c. Laser emission characteristics and category.
   d. Protective equipment in use and eye wear transmission characteristics.
   e. Facility characteristics and configuration.
2. Information needed for medical report of laser incidents:
   a. Location (Bldg, room number, etc.).
   b. Date and time.
   c. Individual(s) exposed (name, grade/rank, SSAN).
   d. Extent of injury (description and diagrams).
   e. Circumstances associated with incident.
   f. Estimated beam energy or power.
   g. Emission characteristics of laser at time of exposure.
   h. Photographs.
   i. Recommendations to prevent recurrence.